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EXPRESS MAIL

February 9, 1988

Mr. Larry Wright, P. E. (6H-EE)  
Chief, Superfund Enforcement Section  
U. S. Environmental Protection Agency  
Region VI  
1445 Ross Avenue  
Dallas, TX 75202

RE: South Cavalcade Site

Dear Mr. Wright:

Enclosed for your review, please find a copy of the Executive Summary for the South Cavalcade RI Report. With this submittal you now have the complete RI Report.

We look forward to meeting with you on the 19th in Dallas.

Sincerely yours,

*James R. Campbell*  
James R. Campbell, Ph. D.  
Manager, Koppers Previously  
Operated Properties

JRC/mrw

Enclosure

cc: D. Sorrels (TWC) W/Attach.  
L. Mays (CDM) "  
D. Chamberlin (CDM) "  
B. Phillips (Clement) "

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## EXECUTIVE SUMMARY

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## EXECUTIVE SUMMARY

### Introduction

Koppers Company, Inc., retained Keystone Environmental Resources, Inc. to perform a remedial investigation at the South Cavalcade Site located in Houston, Texas. The purpose of this investigation was to determine the presence, nature, and extent of possible contamination at this site in the ditch sediments and surface water, surficial soils, subsurface soils, groundwater, and air.

### Site Location

The South Cavalcade Site is located in north Houston, Texas near the 2000 block of Cavalcade Street. The site is approximately 66 acres and is bounded by Cavalcade Street on the north, Collingsworth Street on the south, and Houston Belt & Terminal (HB&T) Railroad on the east and west.

### Site History

In 1910, the National Lumber and Creosoting Company acquired ownership of approximately 55 acres to build and operate a wood treating facility. National Lumber and Creosoting Company apparently operated at the site until 1938 when they were acquired by the Wood Preserving Corporation, a subsidiary of Koppers Company. In 1940, the Wood Preserving Corporation became part of Koppers Company. In 1944, Koppers Company incorporated and became Koppers Company, Inc. Records indicate that the site was operated as a wood treating and coal tar distillation facility until 1962, when the plant was dismantled and the property was sold to Merchants Fast Motor Lines, Inc.

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In 1962, Merchants Fast Motor Lines sold the 55-acre tract to Mr. Gene Whitehead who also purchased an additional 12 acres in 1963. Mr. Whitehead then subdivided the property and in 1965, 1969, and 1977 sold portions to the following current property owners:

TABLE 1  
SUMMARY OF CURRENT PROPERTY OWNERSHIP

<u>Property Owner</u>	<u>Purchase Date</u>	<u>Acreage</u>
Meridian Transport Co. (Merchants Fast Motor Lines)	1965	24.5
	1969	8.5
Baptist Foundation of Texas (leased to Transcon Lines)	1969	22.5
Mr. Rex King (Palletized Trucking)	1977	<u>10.3</u>
		Total 65.8 acres

Investigation and Observation History

A contaminant survey was conducted in 1983 by Camp Dresser & McKee, Inc., (CDM) to evaluate the suitability of the site for use as a maintenance yard and transit station for the proposed METRO-Stage One, Regional Rail System (RRS). The contaminant survey included a preliminary evaluation of shallow soil and groundwater conditions, primarily located throughout the northern portion of the site, with limited analytical testing. Results from the study indicated the potential for localized areas of contamination.

As a result of the Cavalcade Contaminant Survey Report, the site was referred to the Texas Department of Water Resources (TDWR). On April 16, 1984, the TDWR recommended to the U.S. Environmental Protection Agency (EPA) Region VI that the South Cavalcade Site be placed on the updated

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National Priorities List (NPL). On March 28, 1985, Koppers Company, Inc., entered into an Administrative Order on Consent (AOC) with the U.S. Environmental Protection Agency, Region VI. On June 10, 1986, the South Cavalcade Site was included on the final NPL. The South Cavalcade Site ranks 415 out of 802 final sites included on the July 1987 NPL.

#### Field Investigation

The Remedial Investigation for the South Cavalcade Site included the following tasks: Geophysical Surveying; Surface Water Characterization; Surface Sediment Characterization; Subsurface Soil Sampling; Shallow and Deep Groundwater Investigation; and an Air Quality Investigation.

Geophysical Survey. A geophysical feasibility survey was conducted at three test site locations to evaluate three potential geophysical applications: (1) surface resistivity; (2) electromagnetic profiling; and (3) ground-penetrating radar techniques. The electromagnetic profiling method was selected and a site survey was conducted throughout approximately one-quarter of the site area that was not wooded or concrete paved. Results of the geophysical site survey were used to develop a shallow subsurface geophysical anomalies map to assist in locating soil borings.

Surface Water and Sediment Characterization. Both surface water and sediment characterization tasks were combined. A total of seven surface water and sediment samples were collected during Round 1, and nine samples during Round 2. Two rounds of samples were obtained subsequent to rainfall events to evaluate potential surface contaminant transport.

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Analytical testing included HSL volatile and semivolatile organics, HSL metals, cyanide, and iron. Also included was surface film analysis for total petroleum hydrocarbons.

Subsurface Soil Sampling. The initial phase of soil sampling consisted of drilling a total of 139 auger borings to a depth of about 8 ft within the unsaturated zone (vadose zone). Recovered auger boring soil samples were analyzed using photoionization headspace measurements for total organic vapors and X-ray fluorescence for metals. Results of the auger boring sampling were used to construct a preliminary surficial soil anomalies map for evaluating the geophysical anomalies and to assist in locating subsurface (saturated zone) soil borings.

Following the initial auger boring phase, a total of 82 soil borings were continuously sampled to an average depth of 64 ft within the saturated zone. Selected soil samples from the soil borings were screened using photoionization headspace measurements for total organic vapors, X-ray fluorescence for metals, and fluorescence spectrophotometry for total aromatic hydrocarbons (surrogate testing). Selected soil samples from the soil boring surrogate testing program were assigned for semivolatile organic, metals, and cyanide testing. Results of soil boring sampling were used to evaluate subsurface soil quality and to assist in developing a comprehensive groundwater monitoring program.

Groundwater Investigation. During the Remedial Investigation, 20 groundwater monitoring wells were installed. Nine groundwater monitoring wells were previously installed during the Cavalcade Contaminant

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Survey. Therefore, a total of 29 monitoring wells are screened into the two upper-most water-bearing units (18 shallow zone wells and 11 upper intermediate zone wells) to evaluate vertical and lateral extent of potentially impacted groundwater quality. A deep monitoring well was installed to evaluate groundwater quality in a water-bearing zone at a depth of approximately 200 ft. A deep monitoring well was also previously installed during the Cavalcade Contaminant Survey. In addition, two off-site piezometers were also installed into the deep zone to supplement the groundwater monitoring wells for evaluating deep groundwater gradients. Two rounds of groundwater samples were analyzed for volatile and semivolatile organics, pesticides and PCBs, iron, cyanide, and HSL metals.

Air Quality Investigation. Air quality samples were collected at 1 upwind and 2 downwind locations on three consecutive days. Both particulate phase and vapor phase organic compounds were evaluated for EPA Method 604 priority pollutant phenolics and EPA Method 610 polynuclear aromatic hydrocarbon (PAH) compounds.

A Model 2133 Windicator portable wind indicating system was utilized each day to aid in the selection of upwind and downwind sampling positions and to validate the alignment of the sampling stations with respect to the wind direction over the test period.

#### Geology and Hydrogeology Site Summary

The South Cavalcade Site is situated on the Quaternary Gulf Coastal Plain of Texas. This region is comprised of a series of sedimentary depositional plains. The youngest of these plains is of recent, post-glacial deposition

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(Holocene deposits). Sediments of Holocene deposition are deposited along the coast and in alluvial flood plains of present river systems. Progressively older plains (Pleistocene deposits) are associated with the fluvial/deltaic depositional systems of the Beaumont Formation and the Lissie Formation. The depositional environments of the fluvial/deltaic systems consist of distributary channel fill, flood basin/bay fill, and delta fringe environments. Deposits of the Beaumont Formation onlap the older Lissie Formation. The site is situated within surface sediments of the Beaumont Formation.

Soil boring data were utilized to evaluate site hydrogeologic water-bearing zones and aquitards and to characterize the lithology and geometry of the water-bearing zones and aquitards. The primary hydrogeologic aquitards encountered at the site are summarized as follows: shallow aquitard; upper intermediate aquitard; lower intermediate aquitard, and deep aquitard. Hydrogeologic water-bearing zones encountered in the vicinity of the South Cavalcade Site are organized as follows: shallow zone; upper intermediate zone; lower intermediate zone; and deep zone. These water-bearing zones and aquitard units have been explored within depths of about 200-ft below ground surface and are summarized as follows:

PRIMARY HYDROGEOLOGIC DEPOSITS			
<u>Deposit</u>	<u>Geologic Unit Number</u>	<u>Classification</u>	<u>Average Depth (ft)</u>
Shallow Aquitard	1	Aquitard	0-10
Shallow Zone	1	Water-bearing zone	10-21
Upper Intermediate Aquitard	2	Aquitard	21-40
Upper Intermediate Zone	2	Water-bearing zone	40-50
Lower Intermediate Aquitard	3	Aquitard	50-115
Lower Intermediate Zone	3	Water-bearing zone	115-125
Deep Aquitard	4	Aquitard	125-175
Deep Zone	4	Water-bearing zone	175-200

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Summary of Surface Water and Sediment Quality Evaluation

Surface Water Quality. A total of sixteen surface water samples were collected in drainage ditch area during the course of two sampling rounds, including two off-site background samples. Surface water sample analytical data indicates concentrations less than 1 mg/l for both volatile and semivolatile HSL organic compounds. Round 1 and Round 2 surface water samples disclosed no detected polynuclear aromatic hydrocarbon (PAH) compounds. Volatile organics (acetone and methylene chloride) were detected at two sample locations. However, these compounds are considered common laboratory contaminants.

Arsenic was detected at all surface water sampling points but one for both rounds and ranged from 16 ug/l to 56 ug/l. Zinc was detected at all sampling points for both rounds, ranging from 31 to 140 ug/l. Lead was detected at all sampling points but one and ranged from 6.4 to 31 ug/l. Iron was detected at all sampling points for both rounds, ranging from 170 to 3100 ug/l.

Copper was detected at one location in each round at 17 and 14 ug/l, respectively. Nickel was detected at two locations at 36 ug/l. Silver was detected at one location at 11 ug/l, and cyanide was not detected at any location for either round.

A review of the surface water sample analytical data suggests that on-site surface water runoff is not currently a significant contributor to potential contaminant transport. Arsenic was the only metal that exceeded the maximum contaminant level (MCL) of 50 ug/l established by 1986 EPA Safe Drinking Water Act (SDWA) amendments. Arsenic was detected slightly above its MCL value at two locations sampled during the Remedial Investigation (56 ug/l).

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Sediment Quality. A total of sixteen sediment samples were collected in drainage ditch areas during the course of two sampling rounds, including two offsite background samples. A total of five sediment sample locations disclosed detected HSL semivolatile (SV) compounds, with total PAH concentrations ranging from approximately 2.3 mg/kg to 236 mg/kg. The background samples showed no detected HSL semivolatile organic compounds.

HSL volatile organic compounds (VOA) were detected at all five of the sediment sample locations tested, including the background sample. However, acetone and methylene chloride were the only volatile organic compounds detected and are considered common laboratory contaminants.

Although, arsenic, iron, lead, and zinc were detected at most sediment sample locations for both rounds, iron, lead, and zinc were also detected at the two background sediment sample locations. Arsenic was detected at all six on-site sample locations, ranging from 6.2 to 34 mg/kg. Iron was detected at all five locations, ranging from 4400 mg/kg to 9300 mg/kg at the background location. Lead was detected at all seven sample locations, ranging from 10 mg/kg to 540 mg/kg, with the highest concentration of 540 mg/kg at the background location. Zinc was also detected at all seven sample locations, ranging from 58 to 1200 mg/kg, with a background concentration of 630 mg/kg.

Cadmium was detected at one Round 1 location and the background sample, at approximately 4 mg/kg. Chromium was detected at six locations, ranging from 10 to 72 mg/kg, including a background concentration of 18 mg/kg. Copper was detected at six locations ranging from 14 to 89 mg/kg, including a background concentration of 40 mg/kg. Mercury

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was detected at three locations, ranging from 0.29 mg/kg to 1.25 mg/kg at the background location. Nickel was detected at four locations, ranging from 15 mg/kg at the background location to 19 mg/kg. Thallium was detected at one location at 9 mg/kg. Antimony, beryllium, cyanide, selenium, and silver were not detected at any location for either round.

The highest detected sediment PAH concentrations were at the southern end of the site (236 mg/kg). However, PAH concentrations were also detected at an upstream, off-site sample location. Detected sediment metals at all of the on-site sample locations were similar to background conditions, and therefore appear to indicate no significant quality impacts. One exception was arsenic, which was not detected at the background location, but ranged from 6.2 to 34 mg/kg at on-site locations.

#### Soil Analytical Data

Evaluation of soil quality included separate assessments of surficial soils (vadose or unsaturated zone) to a depth of 6 ft and subsurface soils (saturated zone) below a depth of 6 ft.

Surficial Soil. Surficial soils are defined herein as soils from 0 ft to 6 ft deep, which approximately delineates the unsaturated soils of the vadose zone. Samples of the surficial soils were obtained during the shallow auger boring program and from selected shallow samples from the soil boring program.

A total of four surficial soil samples were analyzed for HSL semivolatile organic compounds and select inorganics. A total of 15 different HSL PAH compounds were detected in

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the surficial soils at concentrations ranging from 29 mg/kg to 2100 mg/kg. Total surficial soils HSL PAH concentrations ranged from below method detection limits to 8567 mg/kg.

Surficial soil inorganic indicator (copper, chromium, arsenic, zinc) concentration ranges are presented as follows and are compared with the results of an off-site background sample from Soil Boring SCK-A27-SB01:

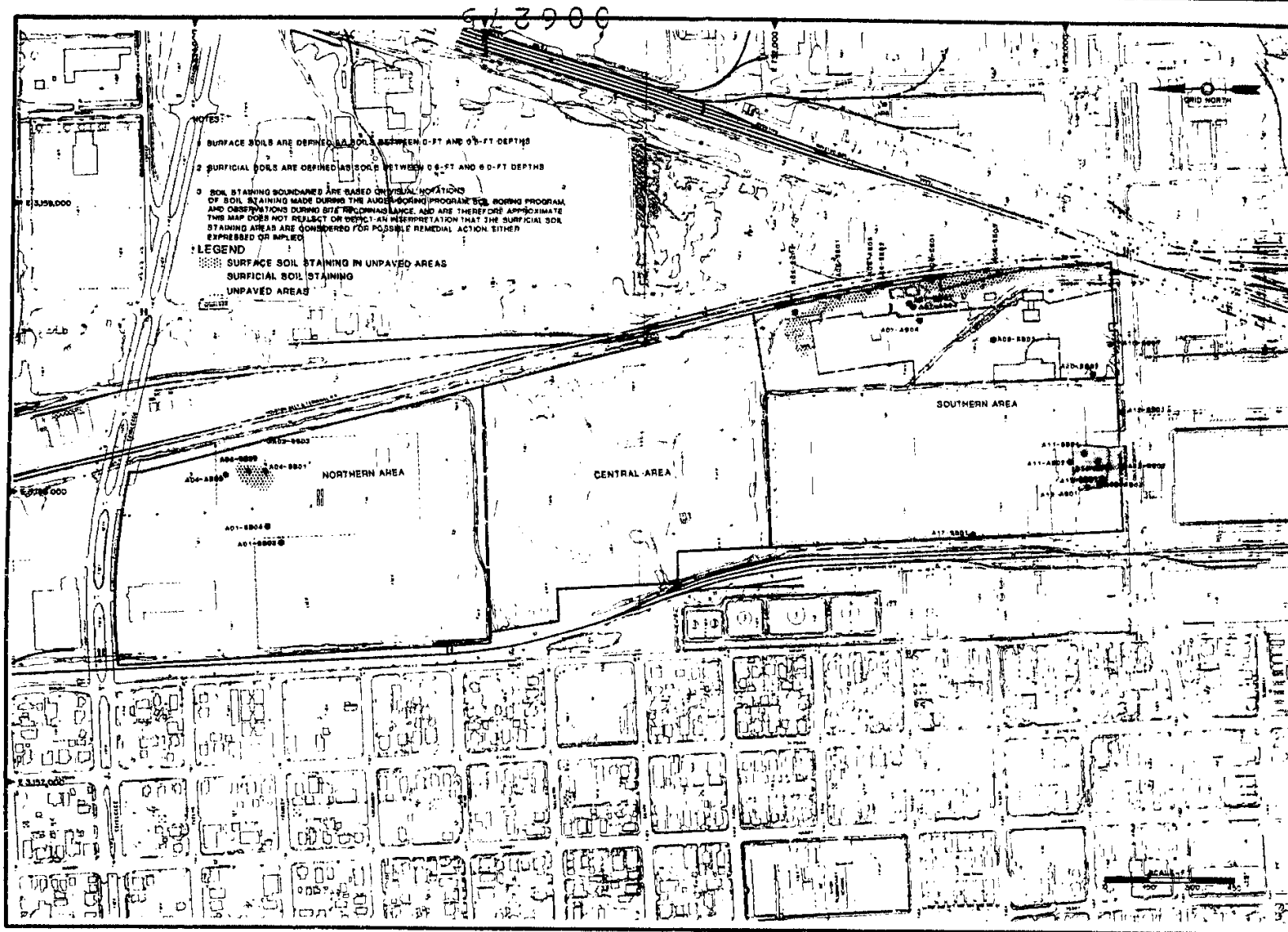
<u>Constituent</u>	<u>Range (mg/kg)</u>	<u>Background (mg/kg)</u>
Copper:	BDL to	BDL
Chromium:	BDL to 9.5	BDL
Arsenic:	BDL to 8.8	BDL
Zinc:	BDL to 3480 mg/kg	12.5

Results of both the auger boring and soil boring programs did not disclose evidence of potential surficial contaminant source areas, such as creosote-saturated soils or non-aqueous phase liquids (NAPL). Soil staining was noted at 15 auger boring locations and in surficial soils at 29 soil boring locations.

Based on observations of visual soil staining conducted during the auger boring and soil boring program, and a general site reconnaissance, a surficial soils quality was prepared showing the approximate areal distributions of both surface and surficial soil staining and is presented on Exhibit 1. Criteria used to prepare the surficial soils quality map are summarized as follows:

1. Surface soils with observable soil staining and discoloration located within unpaved areas.

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PROJECT NO. 64-317	DATE 1-15-90	ENGINEER	DRAWN BY	Page -xl-
SURFICIAL SOILS QUALITY MAP SOUTH CAVALCADE SITE HOUSTON, TEXAS				KOPPERS COMPANY, INC.
EXHIBIT 1				



2. Surficial soils with detected PAH compounds (two samples).
3. Surficial soils with observable soil staining and positive surrogate test results (i.e., laboratory headspace measurements above 5 ppm or detected extractable fluorophores).

The soil quality distributions presented on Exhibit 1 are based on limited quantitative analytical test data and therefore qualitative surrogate test data and visual observations were used to supplement the data base. The surficial soil quality areas shown on Exhibit 1 do not reflect or depict an interpretation that the areas are considered for possible remedial action, either expressed or implied.

Based on interpretations of the surficial soils quality map shown on Exhibit 1, the approximate areal extent of visually stained surface soils (less than 0.5 ft depth) is estimated to be approximately 1.5 acres in upaved areas. The approximate areal extent of visually stained surficial soils (0.5 ft to 6.0 ft) with positive surrogate test results is estimated to be 5.5 acres. It should be noted that these quantities are approximate and represent estimates of soil areas with visual soil staining. These quantities should not be misconstrued as estimates of soil volumes slated for potential remedial actions.

Subsurface Soils. A total of 88 soil samples (excluding two samples analyzed for inorganics only) were analyzed for HSL semivolatile organic compounds and select inorganics. A summary of the total soil PAH concentration ranges for each geologic unit is presented as follows:

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Soil PAH Concentration Ranges

<u>Unit</u>	<u>Range (mg/kg)</u>	<u>Maximum Detected Concentration (mg/kg)</u>
1	BDL to 5020	A12-SB01
2	BDL to 708	A01-SB06
3	BDL to 1416	A10-SB01
4	BDL	BDL

A composite evaluation of soil and groundwater analytical data was conducted to evaluate subsurface quality. Additional subsurface quality data from selected soil surrogate analytical testing was used on conjunction with the soil and groundwater analytical data to complete data gaps.

Groundwater Analytical Data. A total of 60 groundwater samples were analyzed for HSL volatile and semivolatile organic compounds, pesticides and PCBs, and select inorganics. A summary of the total groundwater PAH concentration ranges for the two upper-most water-bearing zones is presented as follows:

Groundwater PAH Concentration Ranges

<u>Zone</u>	<u>Total PAH Range (mg/kg)</u>	<u>Maximum Detected PAH Concentration (mg/kg)</u>
Shallow Zone	BDL to 2195	CAV-OW11
Upper-Intermediate Zone	BDL to 867	SCK-MW14

Non-aqueous phase liquids (NAPL) were noted at three monitoring well locations during sampling (CAV-OW11, SCK-P03, SCK-MW14). A comparison of the shallow zone/upper intermediate zone groundwater PAH distributions at paired monitoring well locations indicates that all shallow wells with detected PAH concentrations correspond to upper

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intermediate wells with detected PAH concentrations. It appears that total PAH concentrations are partially attenuated from the shallow zone to the upper intermediate zone.

Both soil and groundwater data were composited to provide an evaluation of subsurface soil and groundwater quality. Approximate delineations of subsurface distributions are presented on Exhibit 2 for organic compounds. Organic distributions are plotted separately for (1) Unit 1 soil and groundwater constituents; (2) Unit 2 soil and groundwater constituents, and (3) Unit 3 silt layer soil constituents. It should be noted that the distribution boundaries presented on Exhibit 2 are approximate and do not reflect or depict an interpretation that these areas are considered for possible remedial action, either expressed or implied.

As shown on Exhibit 2, the distribution of subsurface composite organic constituents appears to form two discrete areas, one at the northern portion of the site and the other in the southern portion of the site. The northern distribution area generally corresponds to the location of the 1964 aerial photograph anomaly. The Unit 1 northern area is interpolated to extend slightly off-site the northeast property boundary. The Unit 2 northern areas are very similar to the Unit 1 distributions. One localized area was noted in the silt layer, within the northern site area, as shown on Exhibit 2.

The southern distribution area shown on Exhibit 2 encompasses the locations of the former process areas. The Unit 1 southern area appears to have relatively limited downgradient (shallow zone) distribution to the southwest. The Unit 2 southern area indicates possible off-site

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subsurface migration generally limited to the south and southwest. The silt layer soil distribution boundary in the southern area is shown to closely match the distributions in Unit 2.

Groundwater samples from Monitoring Wells CAV-OW06 and SCK-DW02 (deep zone) disclosed no concentrations of semivolatile and volatile organics above the method detection limits. HPLC analyses of samples from the two deep zone monitoring wells for selected PAH compounds did not detect any constituents at a detection limit of 1.00 ng/l.

#### Air Quality Investigation

As part of the South Cavalcade Site Remedial Investigation, an air quality investigation was conducted to characterize the nature and extent of potential air contaminants, if any, in the vicinity of the site. Field measurements made during the survey were compared to established Multimedia Environmental Goals (MEG), which set guideline concentrations of specific compounds in the ambient air based upon health effects (EPA-600/7-77-136, 1977). This investigation has shown that the majority of compounds identified at the site were well below the MEG levels established by EPA.

Of 27 phenolic and PAH compounds analyzed, only two exceeded their respective limits. The two compounds, 2,4-dinitrophenol and 2-methyl-4,6-dinitrophenol, exhibited upwind concentrations equalling or exceeding downwind levels; thus, indicating a higher upwind background concentration for the compounds or possible contamination of the XAD-2 resin and filter.

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A slight increase in the concentration of pentachlorophenol was noted at the downwind stations for Tests 1 and 3. The average net increase ( $4.7 \text{ ug/M}^3$ ), however, for the survey was 100 times less than the TLV-TWA for pentachlorophenol. Pentachlorophenol was also detected in the batch blank and field blank. Hence, it is thought that the presence of pentachlorophenol in the samples is not resultant from the site.

PAH compounds were not identified in air samples during the South Cavalcade Remedial Investigation.

Preliminary Public Health and Environmental Assessment

The Preliminary Public Health and Environmental Assessment (Preliminary PHEA) presented in the RI Report was organized into four major sections including identification of areas of interest, identification of potential contaminants of concern ("PCOCs"), identification of potential exposure pathways, and identification of potential receptors. Emphasis was placed on identifying site specific, plausible exposure scenarios from a list of general scenarios. The scenarios which passed the initial screening during the preliminary PHEA, will be considered further in the Final PHEA which will be presented in the Feasibility Study Report. The Final PHEA will attempt to quantify, within the limits of the specified procedures, potential risk associated with scenarios passing the screening process conducted in the Preliminary PHEA.

The PCOCs identified for the South Cavalcade Site include: arsenic, chromium, copper, light aromatics, PAHs, and zinc. The selection of these PCOCs was based upon site-specific factors such as prior use of the site, and compounds present in the preservatives formerly used.

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Potential human exposure routes retained for evaluation in the Final PHEA were identified for sediments, soil, and groundwater. The specific potential exposure pathways and associated potential receptors which will be evaluated in the Final PHEA are shown on Exhibits 3 and 4.

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EXHIBIT 3  
RETAINED POTENTIAL HUMAN EXPOSURE PATHWAYS

Media	Current or Future	Potential Exposure Pathway	Potential Receptor	PCOCs
=====				
<u>SEDIMENTS</u>				
	Current and Future	inadvertant ingestion	trespassers	PAHs, metals
		dermal contact	trespassers	PAHs, metals
<u>SURFACE AND SURFICIAL SOILS</u>				
	Current	inadvertant ingestion, dermal contact, inhalation of dust	utility workers	PAHs, metals
	Future	inadvertant ingestion, dermal contact, inhalation of dust	construction workers	PAHs, metals
		inadvertant ingestion, dermal contact	hypothetical residential occupants	PAHs, metals
		inadvertant ingestion, dermal contact	hypothetical commercial occupants	PAHs, metals

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## EXHIBIT 3 (continued)

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Media	Current or Future	Potential Exposure Pathway	Potential Receptor	POCs
<u>GROUNDWATER</u>	Future	ingestion	hypothetical residential occupants	light aromatics, PAHs, metals
		ingestion	hypothetical commercial occupants	light aromatics, PAHs metals

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EXHIBIT 4  
RETAINED POTENTIAL ENVIRONMENTAL EXPOSURE PATHWAYS

Sediment

Potential exposures to terrestrial, amphibious and aquatic wildlife from ingesting or dermally contacting sediments in drainage ditches containing PCOCs.

Potential exposures to terrestrial, amphibious and aquatic wildlife from ingesting organisms containing PCOCs.

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